

Case report

Complex management of acute superior mesenteric venous thrombosis in the setting of metastatic ovarian cancer

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1. Background

Venous thromboembolic disease (VTE) can occur in the setting of stasis, vessel injury, or hypercoagulable state. The annual incidence of venous thromboembolic events is estimated to exceed 600,000, with 296,370 VTE-associated deaths annually. VTE is the second leading cause of death in medically and surgically treated patients with cancer. Cancer patients are at an elevated risk of VTE due to several factors, including endothelial injury secondary to tumor burden, prolonged central intravenous access, surgical trauma, chemotherapeutic agents, radiation and immobility (Graul et al., 2017). Among the gynecologic cancers, ovarian cancer has the highest rate of VTE at 3.0%, with 1.6% of patients experiencing deep venous thrombosis (Graul et al., 2017).

Hypercoagulable states, malignancy, surgery, portal hypertension and inflammatory bowel disease are also risk factors for the development of superior mesenteric venous thrombosis (SMVT). SMVT is rare and accounts for only 6–9% of acute mesenteric ischemia cases and 1 in 5000–15,000 hospital admissions (Singal et al., 2013). Approximately 20% of SMVT cases has been associated with neoplasm (Goda et al., 2010). Complications of SMVT include venous congestion resulting in edematous bowel wall, decreased arterial inflow and eventually bowel infarction and ischemia (Singal et al., 2013).

SMVT presents with a spectrum of chronicity, with acute manifestation associated with reported mortality up to 23%, depending on comorbidities (Kim et al., 2017). SMVT may be classified as a primary and secondary condition. Primary SMVT is defined as an idiopathic, spontaneous thrombosis of the mesenteric veins not associated with any disease process (Kitchens, 1992), and accounts for 21–49% of all SMVT

cases. Secondary SMVT is associated with known conditions that predispose the mesenteric venous system to a thrombotic process. SMVT may also be subclassified as acute, subacute or chronic depending on the duration of symptoms; of these, acute SMVT is more likely to result in infarction, and chronic SMVT is more often associated with portal hypertension (Singal et al., 2013).

In this report, we present a patient with metastatic ovarian cancer requiring complex management of superior mesenteric vein thrombosis (SMVT). The patient's consent for publication was obtained.

2. Case report

A 47-year-old female with recurrent metastatic ovarian cancer was admitted for dehydration and abdominal pain, which had worsened with eating over the prior week. She was status post three cycles of neoadjuvant chemotherapy followed by exploratory laparotomy, optimal cytoreduction surgery including total abdominal hysterectomy, bilateral salpingo-oophorectomy, resection of the terminal ileum, cecum with reanastomosis, resection of the rectosigmoid colon with end-colostomy, splenectomy, and pelvic and para-aortic lymphadenectomy. On presentation to the emergency room, she was tachycardic but normotensive. She had no peritoneal signs or serological evidence of ischemia.

Contrast-enhanced computed tomography (CECT) of the abdomen and pelvis showed moderate ascites and occlusive SMV thrombosis extending into the portal vein (PV) without frank bowel ischemia or evidence of intestinal pneumatosis (Fig. 1). Fluid resuscitation was implemented with a goal central venous pressure of 8 mmHg and mean

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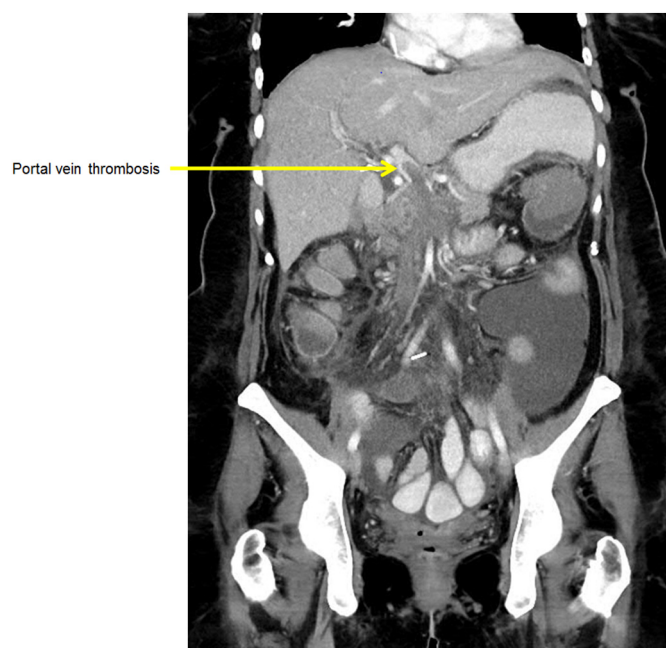


Fig. 1. Coronal plane view of CT of the abdomen and pelvis with contrast showed an occlusive superior mesenteric vein thrombus with non-occlusive extension into the portal vein.

arterial pressure above 70 mmHg. The patient was made NPO. A heparin drip was started with a goal partial thromboplastin time of 60–90 s. Foley catheterization was placed to monitor intraabdominal compartment pressure. Nasogastric intubation was also placed for bowel decompression. Despite this medical management, the patient

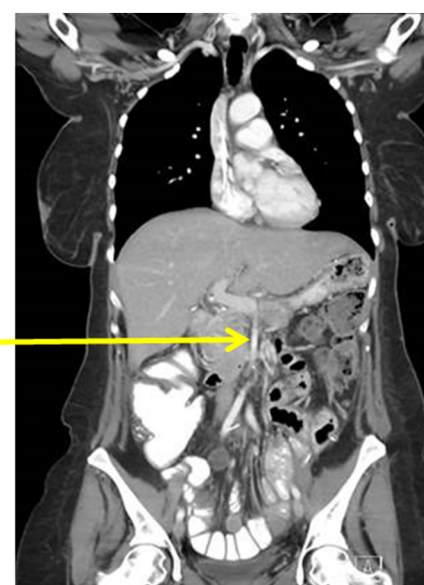


Fig. 3. Coronal plane view of CT of the abdomen and pelvis with contrast showed resolution of SMV and PV thrombus with minimal central SMV stenosis.

abdominal pain worsened with inability to advance her diet.

The patient underwent transhepatic pharmacomechanical thrombectomy using an 8 French-rheolytic catheter (Boston Scientific, Boston, MA) and 10 mg of tissue plasminogen activator (tPA)/500 mL saline instillation followed by angioplasty with a 6 mm diameter balloon that was serially inflated along the course of SMV (Fig. 2-A) and a 10 mm diameter balloon that was inflated near the portal confluence (Fig. 2-B). Repeat venography demonstrated minimal improvement in thrombus burden (Fig. 2-C) and transhepatic catheter-directed



Fig. 2. A. Angioplasty was performed using a 6 mm diameter balloon along the course of SMV. B. Angioplasty was performed using a 10 mm diameter balloon near the portal confluence. C. Repeat venography post-thrombectomy and angioplasty demonstrated minimal reduction of the thrombus burden. D. Repeat venogram twenty-four hours after thrombolysis showed significant improvement in the patency of the superior mesenteric vein.

TREATMENT ALGORITHM

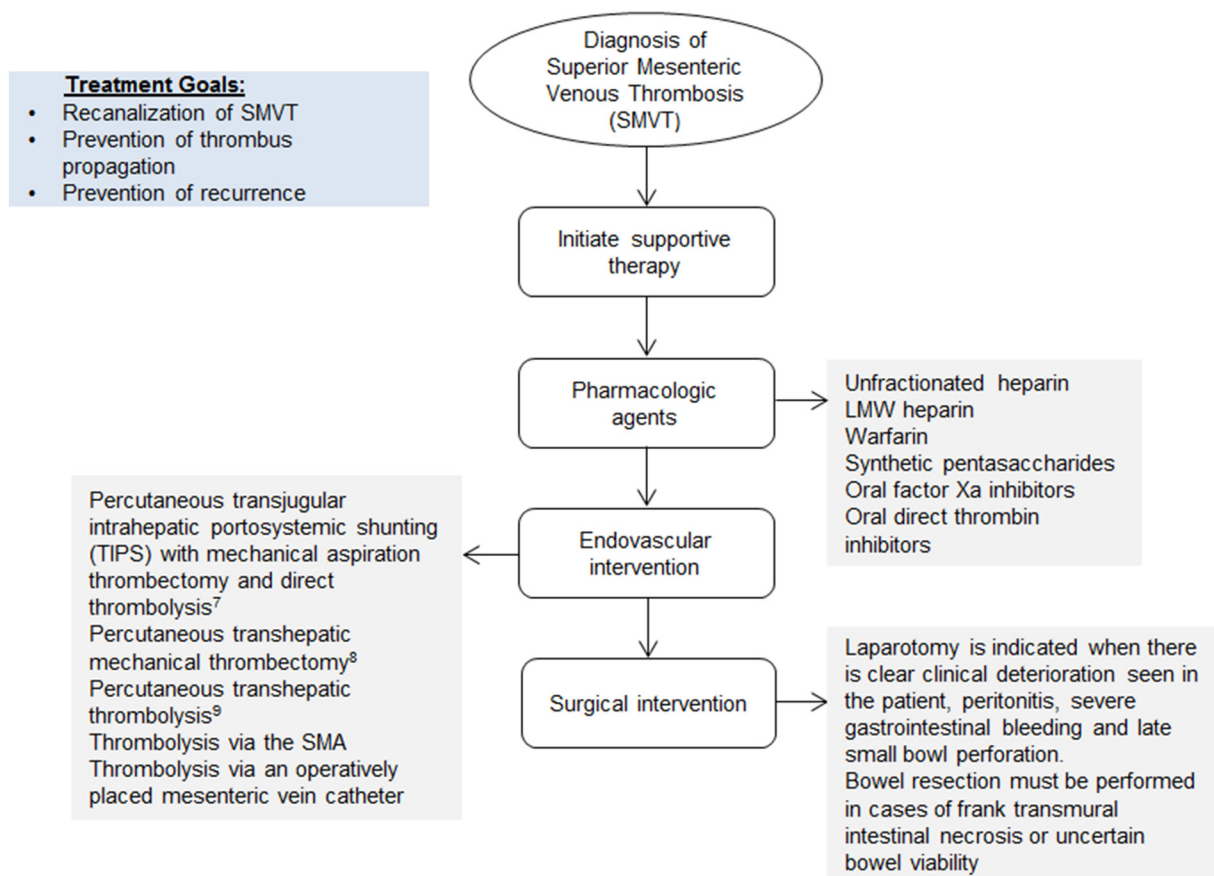


Fig. 4. Treatment algorithm for superior mesenteric venous thrombosis (SMVT).

thrombolysis was initiated via a 10 cm infusion length Cragg-McNamara/ prostream catheter system (Medtronic, Minneapolis, MN) that were advanced into the SMV with infusing tissue plasminogen activator (TPA) at a rate of 1 mg/h. A repeat venogram twenty-four hours later showed significant improvement of the patency of SMV (Fig. 2-D).

The patient had resolution of abdominal pain and full return of bowel function. She was discharged home six days later on subcutaneous Lovenox 0.9 ml (90 mg) twice daily, was transitioned five months post-procedure to Eliquis® (Apixaban) 2.5 mg twice daily and remains on long-term anticoagulation. Six months after intervention, the patient was asymptomatic with no complaints and tolerating adjuvant chemotherapy. Abdominal CECT taken at that time demonstrated resolution of SMV and PV thrombus with minimal central SMV stenosis (Fig. 3).

3. Discussion

3.1. Diagnosis of SMVT

Early diagnosis of SMVT is critical, however, physical findings may not always correlate with severity of ischemia, and laboratory testing is rarely specific to the diagnosis. Serum lactate levels usually do not correlate initially with intestinal infarction, and lactic acidosis is present late in the course of illness. Leukocytosis and hemoconcentration due to dehydration may also be present (Singal et al., 2013). Symptoms such as pain or nausea with food intake may be mistaken for gastrointestinal motility issues, especially in the patient who recently had surgery.

Abdominal imaging, usually via CECT, is typically required to diagnose SMVT, grade its severity, identify potential causes, and assess for associated complications. Contrast-enhanced CT scan is the diagnostic modality of choice, with a reported 90%–100% sensitivity in patients with bowel ischemia and infarctions (Morasch et al., 2001). Some studies have demonstrated high sensitivity and specificity in the diagnosis of mesenteric venous thrombosis with magnetic resonance angiography (MRA), however, motion artifacts may limit accuracy. Additionally, CT is preferred over MR because of its lower costs and wide availability. Duplex ultrasound may be also used at bedside to demonstrate the thrombus; however, this is operator-dependent and not as sensitive as CECT. Nuclear scintigraphy is diagnostic in 75% of the cases, however it is a time-consuming process and therefore not widely performed. Angiography is an invasive diagnostic and therapeutic measure usually reserved for cases with high pretest probability and a non-diagnostic CT/MRI, or in cases where invasive therapeutic measures are planned.

3.2. Management of SMVT

Treatment recommendations for venous thrombosis suggest a hierarchical approach in the selection of supportive therapy, pharmacologic agents, endovascular procedures and surgical interventions (Fig. 4) (Carrier et al., 2018; Ferro et al., 2007; Takahashi et al., 2005; Di Minno et al., 2010).

Specific aims of treatment are recanalization, prevention of propagation of the thrombosis, and prevention of long-term recurrence. Supportive therapy includes pain control, fluid resuscitation, electrolyte

replacement and bowel rest, and should be initiated in all suspected patients at presentation. Pain control decreases the sympathetic response and in turn reduces overall oxygen demand during the hemodynamic crisis. Bowel rest provides relief from increased energy utilization by reducing perfusion demand, the nasogastric tube decreases intraluminal pressure by removing excess gas, and fluid resuscitation replaces the blood lost to the tissue and third space, maintaining blood volume and improving tissue perfusion. These measures minimize venous congestion, improve bowel perfusion, decrease intraluminal pressure and decrease energy demand that could exacerbate infarction and lead to irreversible ischemia. Medications can also be used to control splanchnic blood flow. Octreotide has a potential role in controlling variceal hemorrhage by reducing splanchnic blood flow which leads to decrease in gastric mucosal blood flow.

Anticoagulation with unfractionated or low molecular weight heparin should be initiated as soon as the diagnosis is made, even intraoperatively or in the presence of bleeding, as it has shown to significantly improve survival (Singal et al., 2013; Kumar et al., 2001). Anticoagulation alone may reverse cases of infarcted small bowel without transmural necrosis or perforated bowel, however, close follow-up is required (Brunaud et al., 2001). After the passing of the acute phase and the dissipation of the need for immediate surgical intervention, anticoagulation should be maintained to prevent recurrence of thrombosis (for 3–6 months with reversible disease or indefinitely if hypercoagulable).

In our case, the patient initially presented with symptoms of abdominal pain of unknown etiology and was immediately offered supportive therapy. The patient underwent the standard protocol for diagnosis CT with contrast of the abdomen and pelvis that gave the diagnosis of SMVT. Anticoagulation was started and then invasive treatment was performed when no appreciable improvement in the patient was observed. As the patient continued with underlying risk factors for SMVT, long-term anticoagulation was continued with Eliquis® (Apixaban) to prevent recurrence.

Superior mesenteric venous thrombosis is an uncommon condition but has many common risk factors and carries a very high risk of complication and mortality. Prompt diagnosis and initiation of the appropriate treatment algorithm are therefore crucial to avoid significant morbidity and mortality.

Author contributions

Review of medical records and related literature, manuscript preparation and editing: Ruba Sheikh-Ali, MD, January Moore, BA, Tariq Almeray, MD, Beau Toskich, MD, Matthew W. Robertson, III, MD, Tri A. Dinh, MD, Houssam Farres, MD.

Declaration of Competing Interest

None.

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